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Effects of
Cold.

James P. Boyd.

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An
Inaugural Dissertation
On
The Effects of Cold
By (postscript)
James P. Boyd
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New York

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Effects of Cold

The Subject of Cold, and its effects, has attracted the attention of the most eminent medical men. Its great interest and importance, have given rise to many splendid productions. Impressed with a knowledge of these circumstances, it is with much diffidence, I submit to your inspection, this dissertation; the more so, because I am aware that I can neither improve, nor add any thing, to what has already been presented to the Medical profession, by some of its most distinguished members. A compilation of the facts more worthy of attention, contained in their writings, relative to this interesting subject, is all that can be expected from the student, whose opportunities of observation are necessarily

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erily limited; and whose information therefore is derived chiefly from books.

In the following remarks, I propose, after some general observations on the effects of cold, to consider, first its effects when applied to the whole surface of the body, producing that state called Asphyxia; next its Local effects; or the phenomena exhibited, when only a part of the body is subjected to its influence; and lastly, the treatment.

Cold is now generally considered, as nothing positive, but merely the absence of heat in a greater or less degree. With respect to the Human body, it is only a relative expression, and depends altogether on the previous sensations; so that the same degree of heat or cold, at different times, excites quite opposite feelings. This may be illustrated by placing one hand near a fire, or in a vessel of warm water, while the other is in contact with some ice, or other cold substance. If both hands be now immersed into water of the medium temperature of the Atmosphere, the sensation

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will be that of cold to the hand that was near the fire, while on the contrary the other will feel warmer.

Natural cold is owing to physical causes, over which man has no controul, and which obey the common laws of Nature. The temperature of different countries depends on a variety of circumstances. Elevated situations are colder than those that are less so, although both situated in the same degree of latitude. Cold is modified by the action of the winds, and depends upon the quarter from whence they come. In this part of the globe North winds are always cold, owing to the immense fields of ice, and the mountains situated in the region from whence they come, whose summits are eternally covered with snow. South winds, on the contrary, passing over the burning regions of the Tropics, are of a more elevated temperature.

Cold climates have evidently great influence on the physical character of mankind; this the repeated observations of travellers have shown. The diminished form of the Laplander has been accounted for in

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the manner in which portion of the human ex-
istence is evidently "from the climate" its distinctive char-
acteristics. Striving forever with the inclemency of a se-
vere climate, the destructive action of an icy tempera-
ture; Nature, stunted in her motions, shrunk in her
dimensions; can produce only, beings, whose physical
misactions explain their almost barbarous condition.
In Northern nations, Puberty is protracted to a much
later period. The females do not menstruate so
soon: nor is that fluid discharged in so great a
quantity as in more temperate climates. In Tropi-
cal climates, the Catamenia make their appear-
ance at the age of eleven years, and often at a
much earlier period, and are discharged in the great-
est quantity, or more, several times in the month.
In some, and other countries of the same temperature,
the evacuation is not perceived till the age of four-
teen, and even there it is in small quantity, and
at long intervals: and in many instances, only be-
gins the Summer months. The Limits of these

The first of these is the
 "Lactation" period, which
 is the time when the
 animal is producing milk
 for its young. This period
 is usually the longest of the
 three, and is the time when
 the animal is most susceptible
 to disease. The second is the
 "Pregnancy" period, which
 is the time when the animal
 is carrying the young in the
 uterus. This period is usually
 the shortest of the three, and
 is the time when the animal
 is most susceptible to disease.
 The third is the "Gestation"
 period, which is the time
 when the animal is carrying
 the young in the uterus. This
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some are said to be less active.

In nature of Northern countries are endowed with but little sensibility when compared with the inhabitants of warm climates. It is said by travellers that in the sea he ventured. He found the natives so insensible to their situation, that they bore the top of a round without pain. And according to Bixen and Vancouver, the inhabitants on the North Coast of that continent, thrust sharp pieces of glass into their feet without feeling the slightest uneasiness even so. Whereas, the slightest such wound soon produces in an African, or a native of any other Southern part, violent convulsions, and at times

The influence of cold is also visible on the inferior animals, and vegetables; hence the stunted appearance of the individuals of both these kingdoms in nature in Northern climates. These animals are unable to endure, or to exist in, an atmosphere whose temperature is below the freezing point of water, have recourse to such places of abode in winter

for themselves

are protected from the rigors of the climate. Some bury themselves in the earth, and others pass the winter in a state of torpidity. The fish betake themselves to deep waters; while the feathered birds wing their way, to a more congenial sky. The different genera of the interior animals, are found, we see in situations adapted respectively to their constitutions, and are protected from cold by natural coverings suited to their different conditions. Hence we find, that the animals of the frigid zone, are covered with hair: those of a more temperate climate, with wool; while those that are destined to remain in the frozen regions of the north, are covered with thick fur. Man, however is found in every part of the globe, maintaining a superiority in his physical, as well as in his moral constitution, over the rest of creation.

The utility of clothes, & covering is remarkably weak, as it has a tendency to separate from them but as that nature is in spirit and combine with any

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then having a smaller quantity, that it comes in contact with metal it is equally distributed, or in combination is produced. This property, Caloric is common both in living and dead matter but is it obvious that if living bodies were not supported, other supported bodies these it holds no common with ⁱⁿorganic matter, life must soon be extinguished in an atmosphere, the temperature of which has been reduced below the freezing point. The living body, however enjoys the power of resisting cold, and preserving nearly the same sens. nature, under the frozen climate of the Arctic regions as under the burning atmosphere of the most torrid zone during the most severe winter and the hottest summer. This power of regulating heat exercised by the human body in a state of health, is about 88° of Fahr: birds have a higher temperature, while in cold-blooded animals, as they are called, it is lower than in the human body.

There are many remarkable instances on record, which exhibit in a striking manner, this power of the hu.

[illegible]

man system to resist cold. The sickle in his view of
the human body is almost, that the individuals of our
country attend to their ordinary occupation in the pro-
per with little or no inconvenience, when the ther-
mometer is at 10 to 20 even 30 below zero the force
of Steamers, and that women will stand amidst the
ice, through holes in the ice, for hours a few hours to-
gether, for an hour, with their hands dipping in
the water all the while, and their clothes dripping with
ice. And at the same degree says, if stronger vi-
dence were wanted it might be obtained from the his-
tory of men who have survived the most intense
winter cold, in even double in without any, and in
Silk and cold which caused even the hair to be
seen as well, the whole for about being 6.5 to 7 months.

There are many circumstances that render the
body more liable to the effects of cold. It is not
much more susceptible as then advanced in life
in which the action of the heart and vessels is slow
and feeble, and whose digestive apparatus does not

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 Your obedient servant,
 J. H. [Signature]

perform its functions with so much vigour, in a system
where there is a want of nervous energy, weakness of
the muscles, and also where the system has been exhausted
at its previous exertions, as in any state of a system
where there is a sensible defect a diminution of the
vital power. People are more liable to colds, during
sleep, and convalescence. In the former condition
according to Humboldt, the temperature of the body is
1. to 100 lower than when awake. Also in a debilitated
state from disease. In such circumstances
a dose of cold, which in other conditions of the system
would produce no salutary effects, would
in this case be sufficient to determine the general &
local effects of this agent.

On the contrary, in young, and vigorous persons
all the functions of the animal economy being per-
forming perfectly, and hence the system of the
body possessing a great degree of vitality. The
stage of life developed when the cold is no longer felt
renders it capable of producing its salutary effects.

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stant, particularly the circulating, and of causing re-
action of the vital powers, which hardly resist its deleteri-
ous effects.

Habit modifies the effects of cold, hence we find
that those persons who are born in Northern countries,
and continually exposed to the severity of the weather,
are more able to endure its effects, than those habitua-
lized to a warmer climate, or who pass the greater
part of their time within doors. So that a Hampshire
winter, to a person accustomed to the operation of cold,
would produce no unpleasant effects; in another from
a more mild climate, would be followed by a shiver,
numbness, rigidity, and a degree of immobility, which
could only be overcome by a multiplicity of coverings,
and perseverance in the use of exercise. By the con-
tinued application of cold, the cuticle, and true skin
become thickened, and serve as a natural covering
and protection to the nervous system from its un-
natural severities. This thickening of the skin is very
manifest in the hands of sailors and those several

I have been thinking much lately about the future of our country. I feel that we are at a critical juncture, and it is up to us to decide whether we will remain a united people or become a collection of warring states. I believe that the only way to preserve our Union is by strengthening our bonds of friendship and cooperation. We must stand together in the face of all adversity, and we must never allow ourselves to be divided by sectional interests or personal ambitions. Let us strive to make our country a land of peace and justice for all its inhabitants, and let us remember that our greatest strength lies in our unity.

or of any other class of persons, whose occupation causes their frequent exposure to the weather.

Temperament, also influences the effects of cold. Persons of the Sanguine Temperament, characterized by great activity, and predominance of the Sanguiferous System, a strong frequent and regular pulse, are not susceptible of cold, even as we are more frequently met with than any other in Northern climates, in fact it is the natural consequence of the constant and energetic reaction of the power of the circulation system against the effects of external cold. On the contrary those who are of what the Physicians called the Plethoric, and Richer and the Lymphatic Temperament, marked by pale countenance, the flesh soft and all the vital powers more or less enervated, in such persons, cold's effects are resisted with less energy, and are more apt to be overcome by its deleterious and powerful effects.

The application of cold to the body in a medicinal sense, instead of being injurious to its system, and in

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to contrary, a beneficial, and salutary effect, by concentrating the vital forces, and thereby making all its motions to be performed with more vigor and energy. The pulse becomes stronger and more frequent. The digestion and perfomance of its office with more energy, and the secretions are increased in quantity. A moderate degree of cold by thus promoting digestion, and giving activity to the circulation, according to Aetnaeus, two sources of animal heat, caloric is excited in man's naturally, it is kept in store of that subtracted and carried off by the air and surrounding bodies even though it is felt. It is intimated by some writers that thirst is diminished, while at the same time the appetite is increased. This must be accounted for by the increase of the secretions; the augmented effusions of the Salivary juice into the Stomach promoting appetite, while the increased flow of saliva into the mouth, would naturally have a tendency to abate thirst. For we see during the hot stage of fever, when the secretions are checked up, and the juices almost entirely withheld

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of moisture. There is great thirst, but as soon as the re-
actions are restored, thirst disappears immediately.

Moderate cold, when applied to the body, and at-
tended with a disproportionate reaction of the system, pro-
duces a tonic effect. Thus the same agent that thrust
out to destroy at the same time causes the system to
resist its deleterious influence.

But when cold is applied of greater intensity, its
effects are more apparent. The circulation through the
small superficial vessels, is retarded, and weakened,
and more particularly in those parts that are remote
from the centre of the circulation, as the feet, hands,
ears, nose, scrotum &c. parts which have a large sur-
face exposed to the atmosphere, or other vicarious
medium, by which the heat is carried off. Cutane-
ous perspiration is suppressed; the skin becomes
pale, and contracts around the sebaceous glands and
hairs, producing that peculiar roughness, which has
been called *Cutis aspera*, from its resemblance to the
skin of an unpolished cork*. There is a general in-

* *Cutis aspera* is called

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action of trembling over the whole body, with increased agitation of the lower jaw. The fingers are benumbed and their motions imperfect, and difficult, and even sometimes, impossible, not being obedient to the will. The same is the case with the feet, which also, as well as the rest of the body contract in size. The diminution of bulk in extreme parts is said to be so great, that rings which were tight when in use, are one of the natural temperature, now drop off and even the shoes fall from the feet.

The forces of the system become exhausting, the reaction bears no proportion to the debilitating powers; the action of the heart and arteries, becomes more feeble. The blood is stunted in superficial parts, more particularly the extremities; whence the skin becomes of a shining violet or bluish colour, and the cuticle is eventually detached. This description of the skin is noticed by Capt. Hamilton in his Narrative, which contains a minute description of the natural cold. During winter at these altitudes

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no instant lay. The most interesting observation, his warm
athings, almost every day some of the men that shew a
toward: if any wound blood from the Hæthmæd, are
used, fully frozen; some leave their arms, hands or face
frozen in a trice minute. The skin coming off soon
after they enter a warm room.

As there is the strictest connexion between the
heart and brain: the energy of the latter depending
on the activity of the former, for the exciting influ-
ence of arterial blood. The motions of the heart
therefore, being impeded by the continued action of
extreme cold, less arterial blood is propelled to the
brain, and with diminished velocity; the consequence
of which is a numbness, insensibility, and torpor
of the whole system: a most irresistible propensi-
ty to sleep is felt. The patient lies down, and
if not revived, and kept awake by violent and un-
ceasing exercise, he sleeps to wake no more.

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And over his inmost vitals creeping cold.

Lays him along the snow, a stiffened case.

Stretch'd out, and bleaching in the northern blast.

This propensity to sleep, is mentioned by all authors who have written on the subject; and appears to be the usual attendant of excessive cold. Mr. Thompson however, says it is doubtful how far the state of sleep is the necessary consequence of the application of cold simply, and appears to think there must be some other circumstance present, capable of inducing this state. There are many instances recorded of persons having sustained cold for a long time without inducing much propensity to fall into this state. The remarkable, and interesting case of Elizabeth Woodcock mentioned by many writers, is the most striking; who, it is said, remained a week buried under the snow, without sleeping a great deal.

Baron Larey, in giving a description of the manner in which the French soldiers perished from the severity of the Russian climate, states that a

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dimness of sight, dulness of the countenance, a sort of
idiotism, difficulty of speech, or even a total loss of
this faculty, preceded death in them: and that they
continued to survive a longer, or shorter time in this
half-lifeless situation supported by their compan-
ions. When separated from the main body of the
troops, they fell into detours of snow; when a pain-
ful numbness, followed by a lethargic drowsiness,
seized them, which soon terminated their earthly
existence. To our remarks, but frequently to our death, and
not an unobscured discharge of pain and melancholy
arising from the loss. Long supposed that it was not
unlikely that the heart at the first moment was struck
by mortification, and that the functions of all the organs
ceased at the same moment. Others considered the im-
mediate cause of death, to be a suspension or obliteration
of blood to internal organs. The latter would be explained
by the cold fast, existing in the capillary circulation
as a suspension of blood from the superficial parts, in
consequence of the heart and great vessels, these still re-

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ing, subject to blood to the end last effected to rest
of the brain, when the blood accumulates, causing, no
doubt, a pressure.

There was formerly much dispute among physi-
cians concerning the manner in which this pro-
cess of effluvia is in the words about the mode of action
between the brain and the rest of the body. Some held the opinion
that it operates by subtracting the amount
of blood which is a great stimulant. Since the discovery
however, of the total functions and actions of the brain,
and especially, delineated and ultimately corrected
there are to direct effects, which are directly opposite.
And when after having continued for a time, its influ-
ence is suspended or removed, the system
tends to react, the heart and vessels of the brain
are excited to this great act vigorously, and the blood
which before was driven from the surface and super-
ficial parts, leaving them pale, constricted, and almost
destitute of circulation now returns, and its increased cir-
culation and activity are the movements of the sanguiferous

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ment, that if not moderated by suitable remedial influences, with all its varied sequelae, never fail to follow in its train. These are the indirect, and stimulating effects of cold.

Cullen divided its effects into Stimulant, Tonic, and Sedative, but this division must have arisen from his confounding the direct, with the indirect effects; so that when he speaks of its Stimulant power, he means its indirect action, or the consequences which subsequently result in the ordinary temperature of the atmosphere, after the cold has resigned its place to a more congenial warmth. But, although it is generally admitted, that the operation of cold is directly Sedative, and indirectly Stimulant, it appears to be equally true, that it has a different action, which is directly Stimulant. This is manifested by the practice of sprinkling cold water on persons in a state of Syncope, or Coma, &c. Whether the cold has a simply the contrivance by its tonic and impulse, contributed to re-establish the contrain-

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lous of the heart that had been staid & weakened, & not, I believe, well understood; it is considered by some however, to speak in the latter language.

A question of great importance has been agitated by medical men whether the human body can ever be restored - in having been, &c. Richter he says that it is not at all impossible for a recovery to take place, "when the blood in the heart itself is not hurried twice; when the organs and large bloodvessels still retain a degree of vitality; and there is no extravasation in the brain to render the thing impracticable." And in another sorts that persons who have lain in a torpid state as long as four, or six days have been restored to life. Mr. Saut Cooper however thinks, and in my opinion, very justly that Richter must be in error; and that the cases of recovery he mentions, were only instances, in which there had been a suspension of sensation, and voluntary motion.

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by the operation of cold, which within the whole body,
was even the greater part of it, had been actually in
a state of congelation.

The experiments of the above Hunter are almost
universally conclusive in this point. He exposed dogs
to the influence of a freezing mixture of the lowest
kind of ice & salt, and succeeded in freezing them,
but he was hardly able to extract them, they did not re-
vive. A document was also the subject, but
is incorrect. This he found great difficulty in re-
viving; so vigorous were its powers of generating, and con-
ducting heat, and such the unconducting quality of its
hair, that he did not succeed till he had put
it in life, and also subjected in that manner. His
conclusion therefore is, "an animal must be de-
prived of life before it can be frozen."

The indications to be pursued in the treat-
ment of Asphyxia from Cold; are first, to restore
heat to the body; and secondly, to revive respira-
tion, and restore the circulation.

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It is advised that the patient be brought into a well ventilated room, and rubbed gently with flannels imbued with stimulating substances, and that these actions, should be applied more particularly to the Epigastric region, whilst his feet and legs remain in the mean time immersed in warm water. Doctor Currie recommends a bladder of warm water to the pit of the stomach. He also advises rubs of "Aqua Ammonia" over the Epigastric region. To assist these, we may also apply Potash Alkali to the nostrils. As soon as sensibility is sufficiently restored, and the patient is able to swallow, stimulating drinks, as brandy and water warm wine &c. should be given in small quantities, and frequently repeated. Cooper recommends injections of warm wine.

If the machine should be so violent as to induce convulsions, this should be subdued to render applicable to that condition.

By some it is recommended that the patient

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about 7, being brought into a warm room to stand
in a low temperature and rubbed with ice, now a
man immersed the arm in snow, or cold water,
for the purpose of restoring heat more gradually, and
thus reacting against the effects of the violent
reaction. In summation a too sudden application
of heat. But Doctor Follen has suggested the po-
sibility of making a distinction between the effects of
cold on the system generally as inducing rigor or
dyspnoea, and its local effects on a limb produ-
cing frost-bite. In the latter state he avers
the system may be more easily excited, heat
may be under those circumstances be applied too sud-
denly to a part that is rigid, inflammation and
gangrene will be the result. But in the other
case, where the system generally feels the relative
effects of cold all the vital powers are suppressed.
In that case so forceful an action is not so like-
ly to arise, nor destruction of parts to ensue from
premature stimulation, as all the sensorial functions

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had been suspended.

The Local effects resulting from the application of cold to superficial parts depend on the degree of its intensity. "When portions of the body are exposed to cold, they become of a red colour; and according to Thompson, from a largescence of their bloodvessels, we always find a slight increase of volume, after a time the parts assume a blue, or violet tinge. Where the cold is more intense, the members which are usually puffed, as the nose, ear &c become very pale. Though the person himself is not at all times aware of what is going on, until warned by some one present. There is a shivering, and numbness attending this change of colour - in some cases however, there is pain even during exposure.

Under these circumstances there is a sudden transition to heat, from the patients going into a warm room, or near a fire; a tingling, itching sensation is produced; and is often increased to an intense glow, with pain. This being

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permitted to go on, inflammation is often the consequence.
This is Thompson's first species of Frost-bite, his second
is where vesications, subpurulation, or ulceration takes
place.

These phenomena are produced by a moderate
degree of cold, followed by the application of heat.
Richie was the first who explained that these ap-
pearances were not owing to the direct application
of cold, but to the reaction that takes place in the
system. They are the secondary, or indirect effects of a
reduction of temperature. Cold is therefore no more
than the predisposing cause of Chilblains. This is
confirmed by Lacey, who gives many facts which
show that inflammation is excited by the sud-
den change from a cold to a warm temperature.
During the Russian expedition, the weather was re-
markably cold, yet although the thermometer fell
from 20, to 30 degrees below the freezing point of
Fah't none of the soldiers experienced any inconvenience
but as soon as the thermometer rose to 6 or 8 degrees

even the porous wood, seems to gain to compare of waste
gain in their act, multiplying their estimate to both.
as a slight redness and redness about the base of the
lost, and upon the part. is lost; the loss being deprived
of heat, even because of a black color, and most
consequence.

Thus a very minute degree of cold is so, that the
velocity of water is very reduced. The extreme, a more
violent part is either immediately destroyed, by the di-
rect action of cold, a permanent inflammation is ex-
cited, and it travels to the circumference.

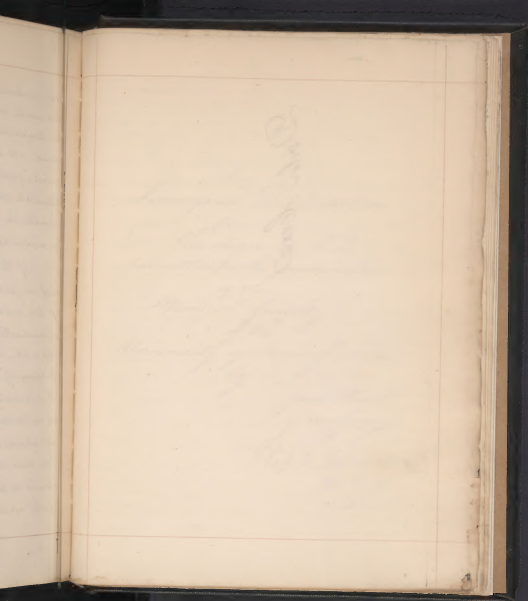
At this time much to remove of opinion exists among
writers with regard to the treatment of present when
the whole system is affected by cold. Some are of opinion
to be severe when such are the subjects of its action.
As it has been shown the sudden application of heat
to frost-bitten parts were liable to occasion inflammation
there and gangrene, it is undeniably necessary that
a due regulation of the temperature should be particu-
larly attended to. Warmth should be restored to the part



very gradually. It is directed that the affected limb be rub-
bed with snow, or ice, or immersed in very cold water,
the temperature of which may be afterwards gradually
raised. As soon as action, and returning sensation is per-
ceived, frictions with flannel wet with brandy, or Cam-
phreatic spirit should be substituted. The patient
should be placed in bed, and perspiration induced
by warm drinks.

If these means are judiciously applied: the part
will be gradually restored to a healthy state, but if hast-
ily or too suddenly applied, it may terminate in a chronic
inflammation, which will require stimulants, as Muri-
atic acid - Muriate of Ammonia, Spirit of Turpentine,
Balsam of Capivi &c.

If mortification should be the consequence, it must be treat-
ed in the same manner, as when it arises from other causes. Dr. Je-
sey advised the application of blisters to hasten the separation
of the dead parts, and the ulcers left after the separation of the
floughs, to be treated with Balsamum, rendered stimulating
by the addition of Spirit of Turpentine.



Doctor Lane

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